SHARP

TECHNICAL   LITERATURE

FOR

TFT - LCD   module

MODEL No. LQ150U1LW21

The   technical   literature   is   subject   to   change   without   notice.
So ,   please   contact   Sharp   or   its   representative   before   designing
your   product   based   on   this   literature.

DEVELOPMENT ENGINEERING DEPT. 2
TFT DIVISION 3
TFT LIQUID CRYSTAL DISPLAY GROUP
SHARP   CORPORATION

RECORDS OF REVISION

LQ150U1LW21

SPEC No.	DATE	REVISED		SUMMARY	NOTE
		No.	PAGE		
LD 13652	Jun. 8. 2001				1st Issue

1. Application

    This technical literature applies to a color TFT-LCD module,LQ150U1LW21

2. Overview

    This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). This module is based on the standards of SPWG(Standard Panels Working Group).

It is composed of a color TFT-LCD panel, driver ICs, control circuit, power supply circuit, and a backlight unit. Graphics and texts can be displayed on a 1600× 3× 1200 dots panel with 262,144 colors by using LVDS (Low Voltage Differential Signaling) to interface and supplying +3.3V DC supply voltage for TFT-LCD panel driving and supply voltage for backlight.

The TFT-LCD panel used for this module has very high aperture ratio. A low-reflection and higher-color-saturation type color filter is also used for this panel. Therefore, high-brightness and high-contrast image, which is suitable for the multimedia use, can be obtained by using this module.

    Optimum viewing direction is 6 o'clock.

    Backlight-driving DC/AC inverter is not built in this module.

[Features]

    1) High aperture panel; high-brightness or low power consumption.

    2) Brilliant and high contrast image.

    3) Small footprint and thin shape.

    4) Light weight.

3. Mechanical Specifications

Parameter	Specifications	Unit
Display size	38 (15.0") Diagonal	cm
Active area	304.0 (H)× 228.0 (V)	mm
Pixel format	1600 (H)× 1200 (V)	pixel
	(1 pixel = R+G+B dots)	
Pixel pitch	0.190(H)× 0.190 (V)	mm
Pixel configuration	R,G,B vertical stripe	
Display mode	Normally white	
Unit outline dimensions *1	317.3(W)× 242.0 (H)× 7.0max.(D)	mm
Mass	(680)	g
Surface treatment	Anti-glare and hard-coating 2H Low reflection (1.7%Maximum)	

    *1.Note : excluding backlight cables.

    Outline dimensions is shown in Fig.1

4. Input Terminals

  4-1. TFT-LCD panel driving

    CN1 (LVDS signals and +3.3V DC power supply)

        Using connector : FI-XB30S-HF10 (JAE)

   Corresponding connector : FI-X30M, or FI-X30H (JAE)

Pin No.	Symbol	Function	Remark
1	GND		
2	Vcc	+3.3V power supply	
3	Vcc	+3.3V power supply	
4	Vedid	DCC +3.3V power supply	
5	NC	Reserved	
6	CLKedid	DDC Clock	
7	DATAedid	DDC Data	
8	R1IN0-	Receiver signal of A side pixels (-)	LVDS
9	R1IN0+	Receiver signal of A side pixels (+)	LVDS
10	GND		
11	R1IN1-	Receiver signal of A side pixels (-)	LVDS
12	R1IN1+	Receiver signal of A side pixels (+)	LVDS
13	GND		
14	R1IN2-	Receiver signal of A side pixels (-)	LVDS
15	R1IN2+	Receiver signal of A side pixels (+)	LVDS
16	GND		
17	CK1IN-	Clock signal of A side pixels (-)	LVDS
18	CK1IN+	Clock signal of A side pixels (+)	LVDS
19	GND		
20	R2IN0-	Receiver signal of B side pixels (-)	LVDS
21	R2IN0+	Receiver signal of B side pixels (+)	LVDS
22	GND		
23	R2IN1-	Receiver signal of B side pixels (-)	LVDS
24	R2IN1+	Receiver signal of B side pixels (+)	LVDS
25	GND		
26	R2IN2-	Receiver signal of B side pixels (-)	LVDS
27	R2IN2+	Receiver signal of B side pixels (+)	LVDS
28	GND		
29	CK2IN-	Clock signal of B side pixels (-)	LVDS
30	CK2IN+	Clock signal of B side pixels (+)	LVDS

    Note 1   Relation between LVDS signals and actual data shows below section (4-2).

    Note 2   The shielding case is connected with signal GND.

.

4-2 Interface block diagram

Using receiver   THC63LVD814 (THINE)   Corresponding Transmitter   THC63LVDM63A (THINE), DS90C363,DS90C383(National semiconductor

TxIN 18～20 must be fixed "Low".

Symbol of CN1 (Pin No.)
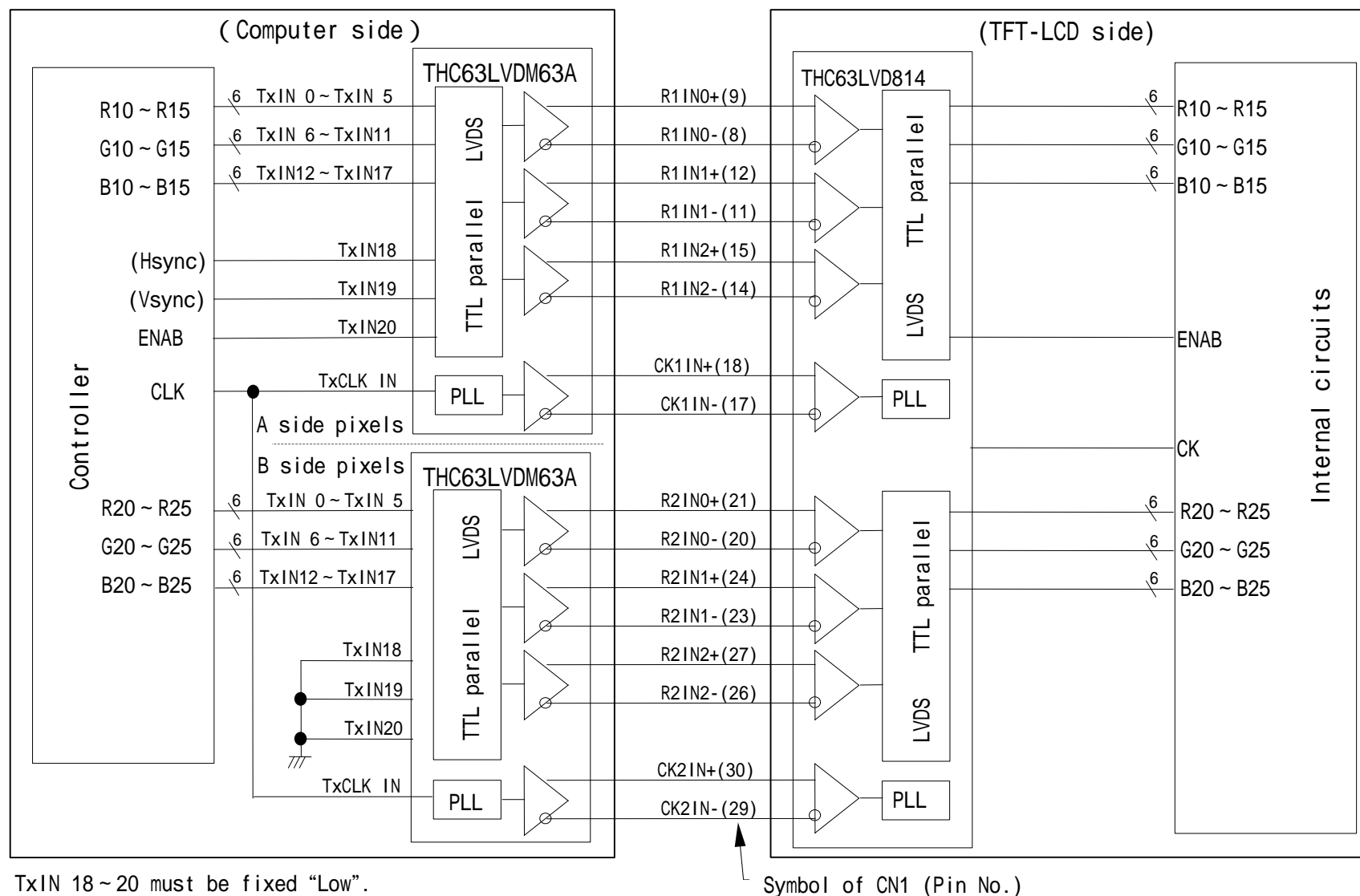
4-3. Backlight driving

CN2 : BHSR-02VS-1(JST)

Mating connector : SM02B-BHSS-1-TB(JST)

Pin no.	symbol	function
1	V_{HIGH}	Power supply for lamp　(High voltage side)
2	V_{LOW}	Power supply for lamp　(Low voltage side)

5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings		Unit	Remark
Input voltage	V_I	Ta=25	0.3	Vcc+0.3		Note1
+3.3V supply voltage	Vcc	Ta=25	0	4		
Storage temperature	Tstg		25	60		Note2
Operating temperature	Topa		0	50		

Note1　LVDS signals

Note2　Humidity　95%RH Max. at Ta　40　.

Maximum wet-bulb temperature at 39　or less at Ta>40　.

No condensation.

6. Electrical Characteristics

6-1.TFT-LCD panel driving　　　　　　　　　　　　　　　　　Ta　25

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Vcc	Supply voltage	Vcc	+3.0	+3.3	+3.6		Note2
	Current dissipation	Icc		(730)	TBD		Note3
Permissive input ripple voltage		V_{RP}			100	mV p-p	Vcc=+3.3V
Input voltage range		V_I	0		2.4	V	LVDS signal
Differential input threshold voltage	High	V_{TH}			+100	mV	V_{CM}=+1.2V
	Low	V_{TL}	−100			mV	Note1
Input current (High)		I_{OH}			± 10	μ A	V_I=2.4V Vcc=3.6V
Input current (Low)		I_{OL}			± 10	μ A	V_I=0V　Vcc=3.6V
Terminal resistor		R_T		100			Differential input

Note1　V_{CM} : Common mode voltage of LVDS driver.
Note2　On-off conditions for supply voltage

Vcc rise time

　t1　10 ms

On time Vcc and signal

　0　t2　50 ms

Off time signal and Vcc

　0　t3　50 ms

Off time Vcc

　400ms　t4

On time lamp and signal

　200ms　t5
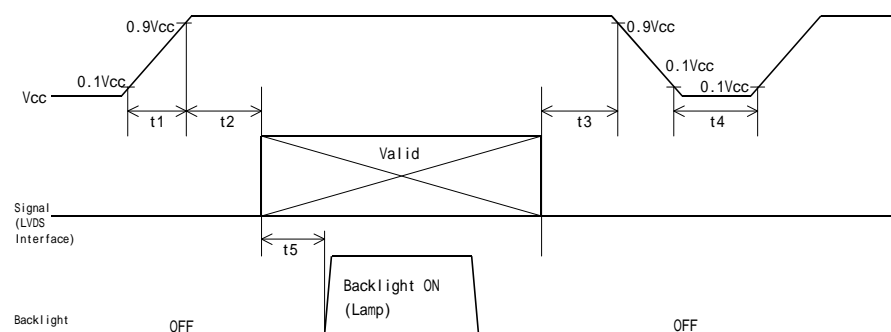
Power sequence for Backlight is not especially specified, however it is recommended to consider some timing difference between LVDS input and Backlight input as shown above.

If the Backlight lights on before LCD starting, or if the Backlight is kept on after LCD stopping, the screen may look white for a moment or abnormal image may be displayed.

This is caused by variation in output signal from timing generator at LVDS input on or off. It does not cause the damage to the LCD module.
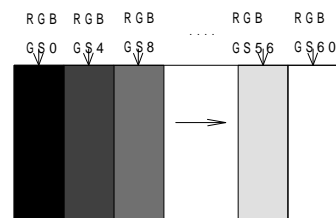
Vcc-dip conditions
1) 2.5 V ≤ Vcc ≤ 3.0 V
   td ≤ 10 ms
2) Vcc ≤ 2.5 V
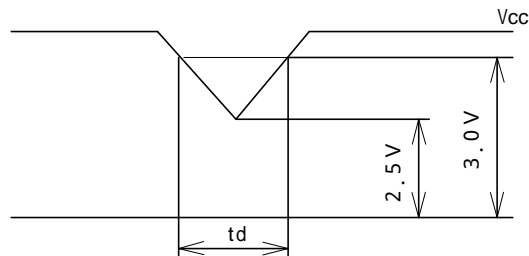
Vcc-dip conditions should also follow the On-off conditions for supply voltage.

Note3   Typical current situation : 16-gray-bar pattern.
Vcc=+3.3V

6-2. Backlight driving

The backlight system is an edge-lighting type with single CCFT (Cold Cathode Fluorescent Tube).

The characteristics of the only lamp are shown in the following table.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark	
Lamp current range	I_L	TBD	(6.0)	TBD	mArms	Note1	
Lamp voltage	V_L		TBD		Vrms		
Lamp power consumption	P_L		TBD		W	Note2	
Lamp frequency	F_L	TBD	TBD	TBD	KHz	Note3	
Kick-off voltage	V_S			TBD	Vrms	Ta=25	
				TBD	Vrms	Ta=0	Note4
Lamp life time	L_L	(10000)			Hour	Note5	

Note1   Lamp current is measured with current meter for high frequency as shown below.

Module   Inverter
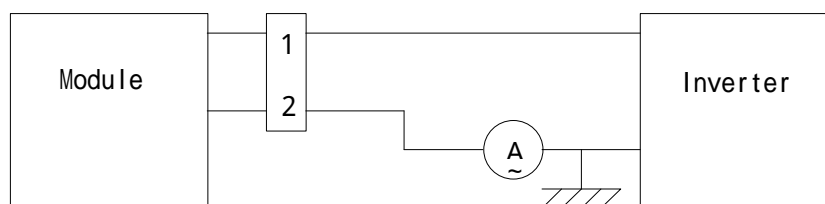
* 2pin is V_{LOW}

Note2   Calculated value for reference ($I_L \times V_L$)

Note3   Lamp frequency may produce interference with horizontal synchronous frequency, and
         this may cause beat on the display. Therefore lamp frequency shall be detached as
         much as possible from the horizontal synchronous frequency and from the harmonics
         of horizontal synchronous to avoid interference.

Note4   The voltage above this value should be applied to the lamp for more than 1 second to start-
         up. Otherwise the lamp may not be turned on.

Note5   Lamp life time is defined as the time when either   or   occurs in the continuous
         operation under the condition of Ta = 25   and I_L = (6.0) mArms.

         Brightness becomes 50 % of the original value under standard condition.

         Kick-off voltage at Ta = 0   exceeds maximum value, (1600) V rms.

Note)   The performance of the backlight, for example life time or brightness, is much influenced
        by the characteristics of the DC-AC inverter for the lamp. When you design or order the
        inverter, please make sure that a poor lighting caused by the mismatch of the backlight and
        the inverter (miss-lighting, flicker, etc.) never occur. When you confirm it, the module should
        be operated in the same condition as it is installed in your instrument.

7. Timing characteristics of input signals

7-1. Timing characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	1/Tc	50	80	80	MHz	
	Skew	Tcsq	–2	0	2	ns	Note1
Data enable Signal	Horizontal period	TH	979	1056	1106	clock	
			12.24	13.2		μs	
	Horizontal period (High)	THd	800	800	800	clock	
	Vertical period	TV	1202	1250	1280	line	Note2
			14.71	16.67		ms	
	Vertical period (High)	TVd	1200	1200	1200	line	

Note1   Lvds (A Side data)– Lvds (B side data) phase difference

Note2   In case of using the long vertical period, the deterioration of display quality, flicker, etc.,
may occur.
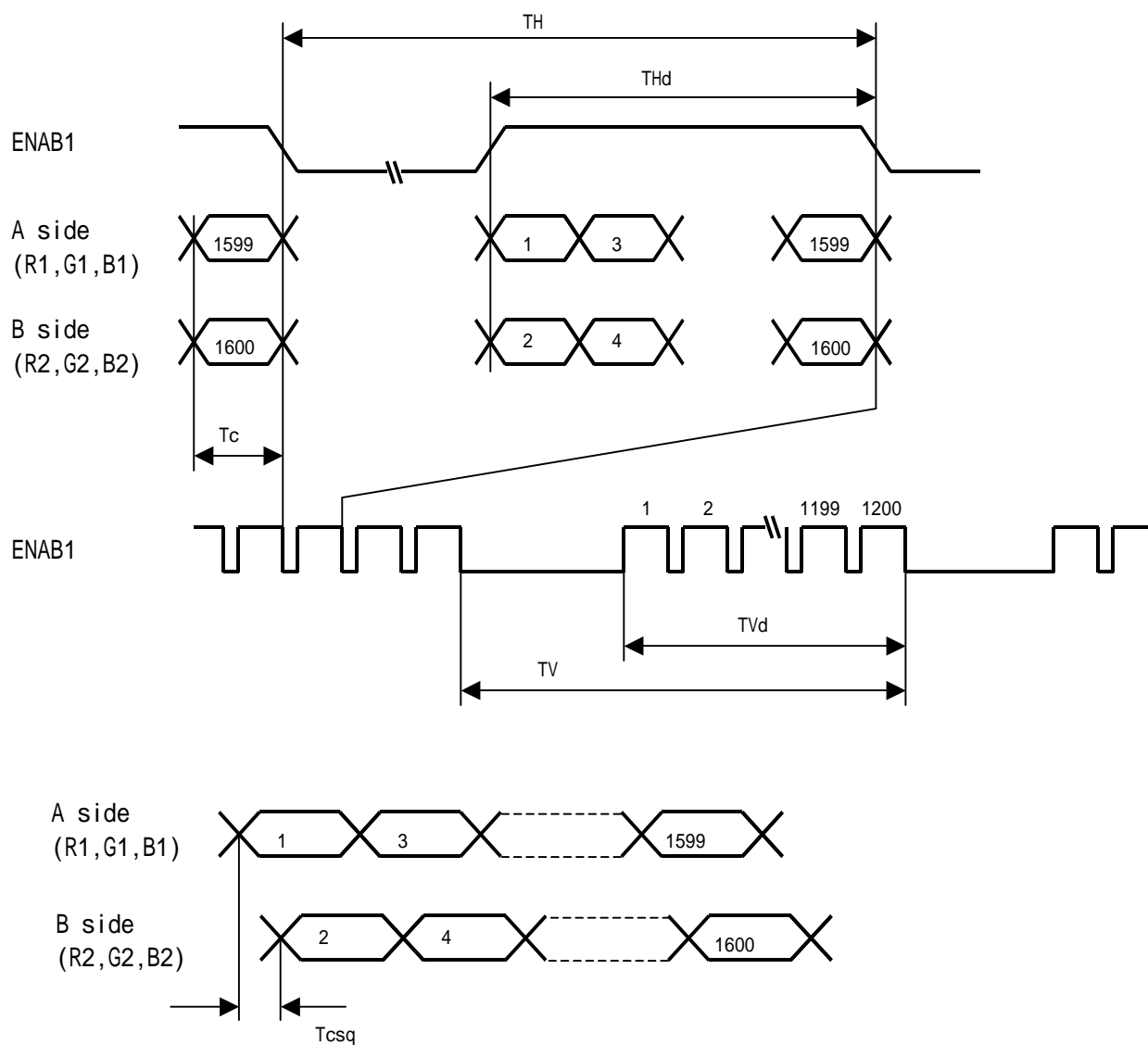
7-2. Input Data Signals and Display Position on the screen

R1	G1	B1	R2	G2	B2
(		)	(		)

Two pixels-data are sampled at the same time.

A side	R10 R15, G10 G15, B10 B15	
B side	R20 R25, G20 G25, B20 B25	

1 1600

1200 1600

1200 1

Display position of input data
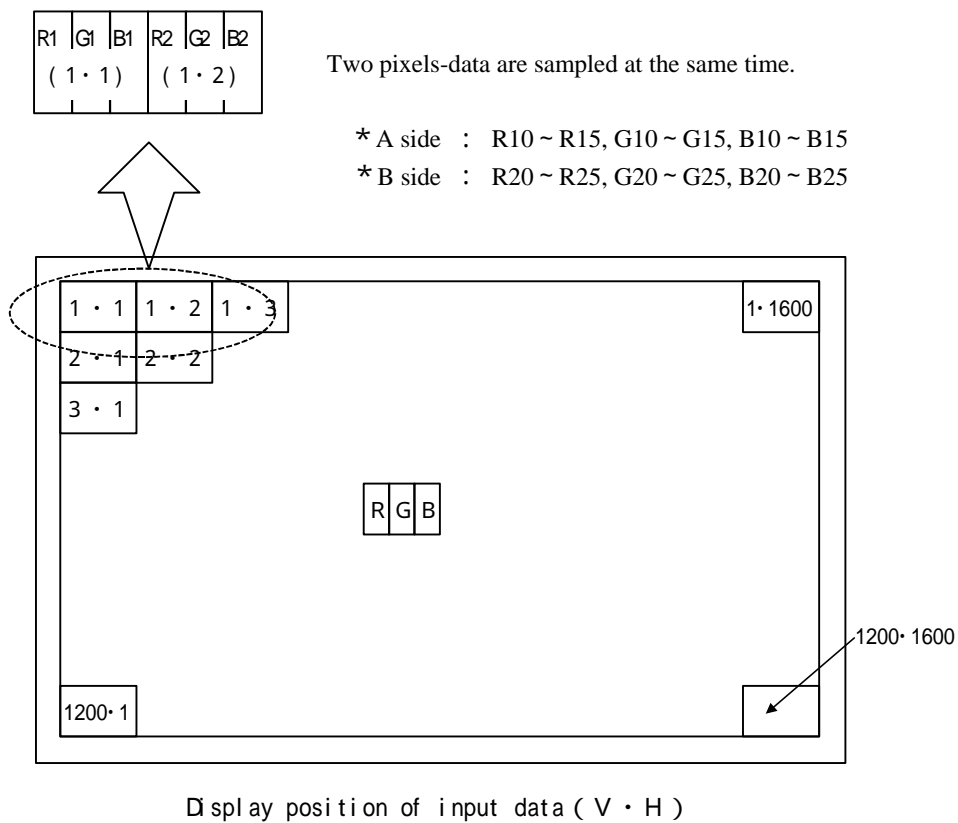
8. Input Signals, Basic Display Colors and Gray Scale of Each Color

Colors & Gray scale		GrayScale	R10	R11	R12	R13	R14	R15	G10	G11	G12	G13	G14	G15	B10	B11	B12	B13	B14	B15
			R20	R21	R22	R23	R24	R25	G20	G21	G22	G23	G24	G25	B20	B21	B22	B23	B24	B25
Basic Color	Black		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue		0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Green		0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Cyan		0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red		1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta		1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow		1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓			↓						↓						↓			
	⇩	↓			↓						↓						↓			
	Brighter	GS61	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS62	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS63	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	⇧	↓			↓						↓						↓			
	⇩	↓			↓						↓						↓			
	Brighter	GS61	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
	⇩	GS62	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
	Green	GS63	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	⇧	↓			↓						↓						↓			
	⇩	↓			↓						↓						↓			
	Brighter	GS61	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	⇩	GS62	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Blue	GS63	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

0 : Low level voltage, 1 : High level voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. According to the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.

9. Optical Characteristics

Ta=25 , Vcc=+3.3V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	21, 22	CR>10	TBD	(70)		Deg.	Note1,4
	Vertical	11		TBD	(50)		Deg.	
		12		TBD	(60)		Deg.	
Contrast ratio		n	=0°	250				Note2,4
		o	Optimum viewing angle		TBD			
Response time	Rise	r	=0°		TBD		ms	Note3,4
	Decay	d			TBD		ms	
Chromaticity of white					(0.313)			Note4
					(0.329)			
Note4				TBD	(180)		cd/m^2	I$_L$ = (6.0mA) F$_L$ (TBD)
White Uniformity						(1.45)		Note5

The measurement shall be executed 30 minutes after lighting at rating. (typical condition: I$_L$ =(6mA)rms)

The optical characteristics shall be measured in a dark room or equivalent state with the method shown in Fig.2 below.
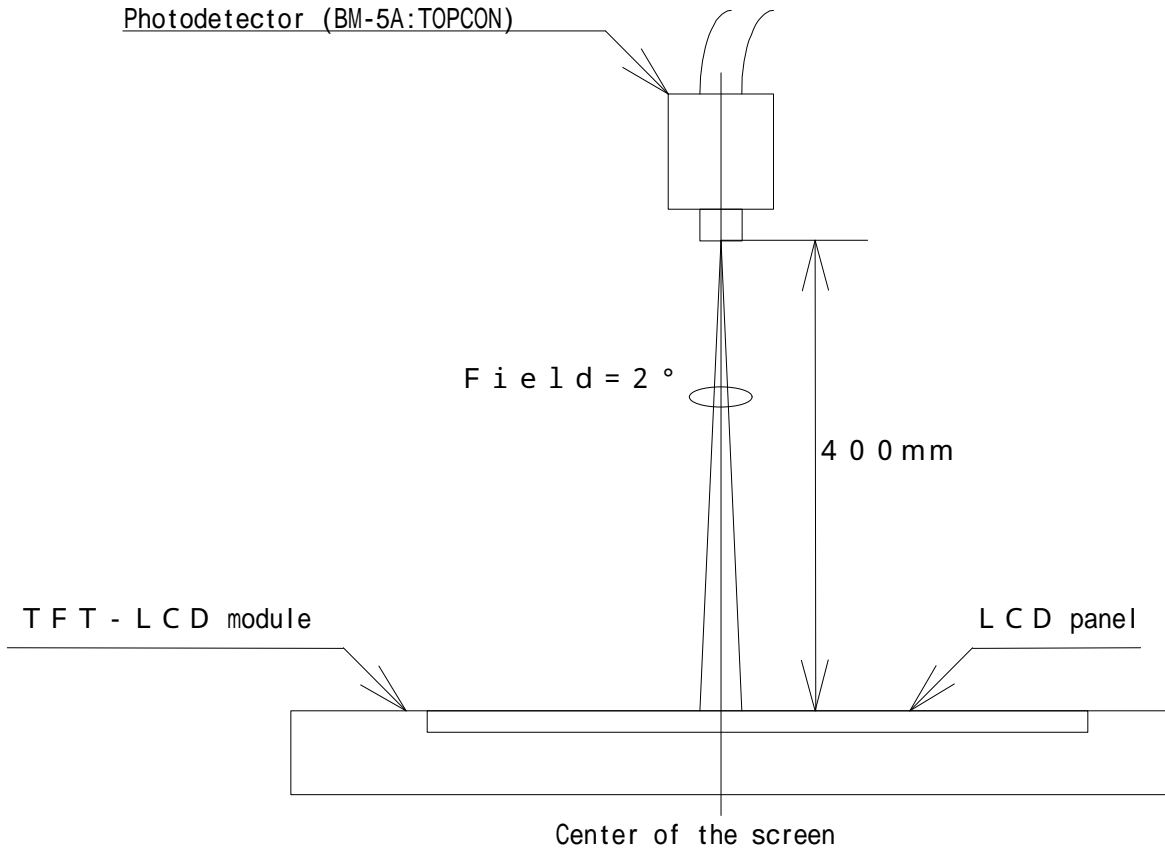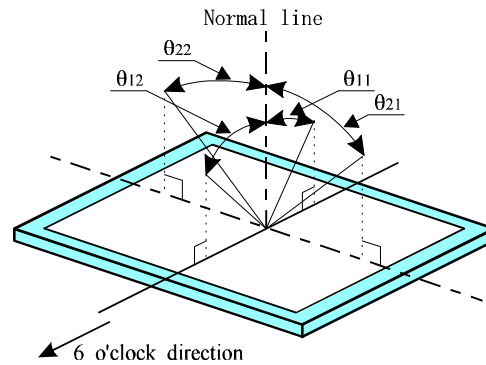

Photodetector (BM-5A: TOPCON)

module   panel

Center of the screen

Fig.2 Optical characteristics measurement method

Note1   Definitions of viewing angle range:

Note2   Definition of contrast ratio:

The contrast ratio is defined as the following.

$$\text{Contrast Ratio (CR)} \quad \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$
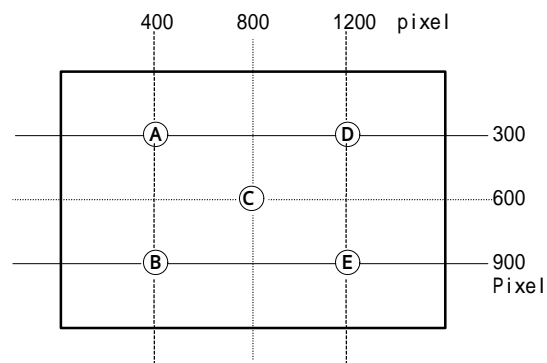
Note3   Definition of response time:

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white" .
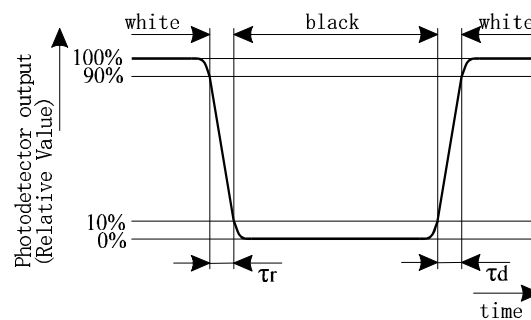
Note4   This shall be measured at center of the screen.

Note5   Definition of white uniformity:

White uniformity is defined as the following with five measurements (A   E).

$$\text{w} \quad \frac{\text{Maximum Luminance of five points (brightness)}}{\text{Minimum Luminance of five points (brightness)}}$$

10. Display Quality

The display quality of the color TFT-LCD module shall be in compliance with the Incoming
Inspection Standard.

11. Handling Precautions

a) Be sure to turn off the power supply when inserting or disconnecting the cable.

b) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist.

c) Since the front polarizer is easily damaged, pay attention not to scratch it.

d) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.

e) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.

f) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.

g) Since CMOS LSI is used in this module, take care of static electricity and injure the human earth when handling.

h) Observe all other precautionary requirements in handling components.

i) This module has its circuitry PCBs on the rear side and should be handled carefully in order not to be stressed.

j) Laminated film is attached to the module surface to prevent it from being scratched . Peel the film off slowly just before the use with strict attention to electrostatic charges. Ionized air shall be blown over during the action. Blow off the 'dust' on the polarizer by using an ionized nitrogen gun, etc..

k) When handling LCD modules and assembling them into cabinets, please be noted that long-term storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the LCD modules.

12. Packing form

a) Piling number of cartons (TBD) cartons

b) Package quantity in one carton : (TBD) pcs

c) Carton size : (TBD)mm

d) Total mass of one carton filled with full modules : (TBD)g

13 Reliability test items

No.	Test item	Conditions
1	High temperature storage test	Ta = 60 240h
2	Low temperature storage test	Ta = 25 240h
3	High temperature & high humidity operation test	Ta = 40 ; 95 %RH 240h (No condensation)
4	High temperature operation test	Ta = 50 240h (The panel temp. must be less than 60)
5	Low temperature operation test	Ta = 0 240h
6	Vibration test (non- operating)	Frequency : 10 57Hz/Vibration width (one side):0.075mm : 58 500Hz/Gravity:9.8m/s^2 Sweep time : 11 minutes Test period : 3 hours (1 hour for each direction of X,Y,Z)
7	Shock test (non- operating)	Max. gravity : 490 m/s^2 Pulse width : 11 ms, sine wave Direction : $\pm$ X,$\pm$ Y,$\pm$ Z once for each direction.

14 Others

1) Lot No. Label:

SHARP
LQ150U1LW21
16 600001_
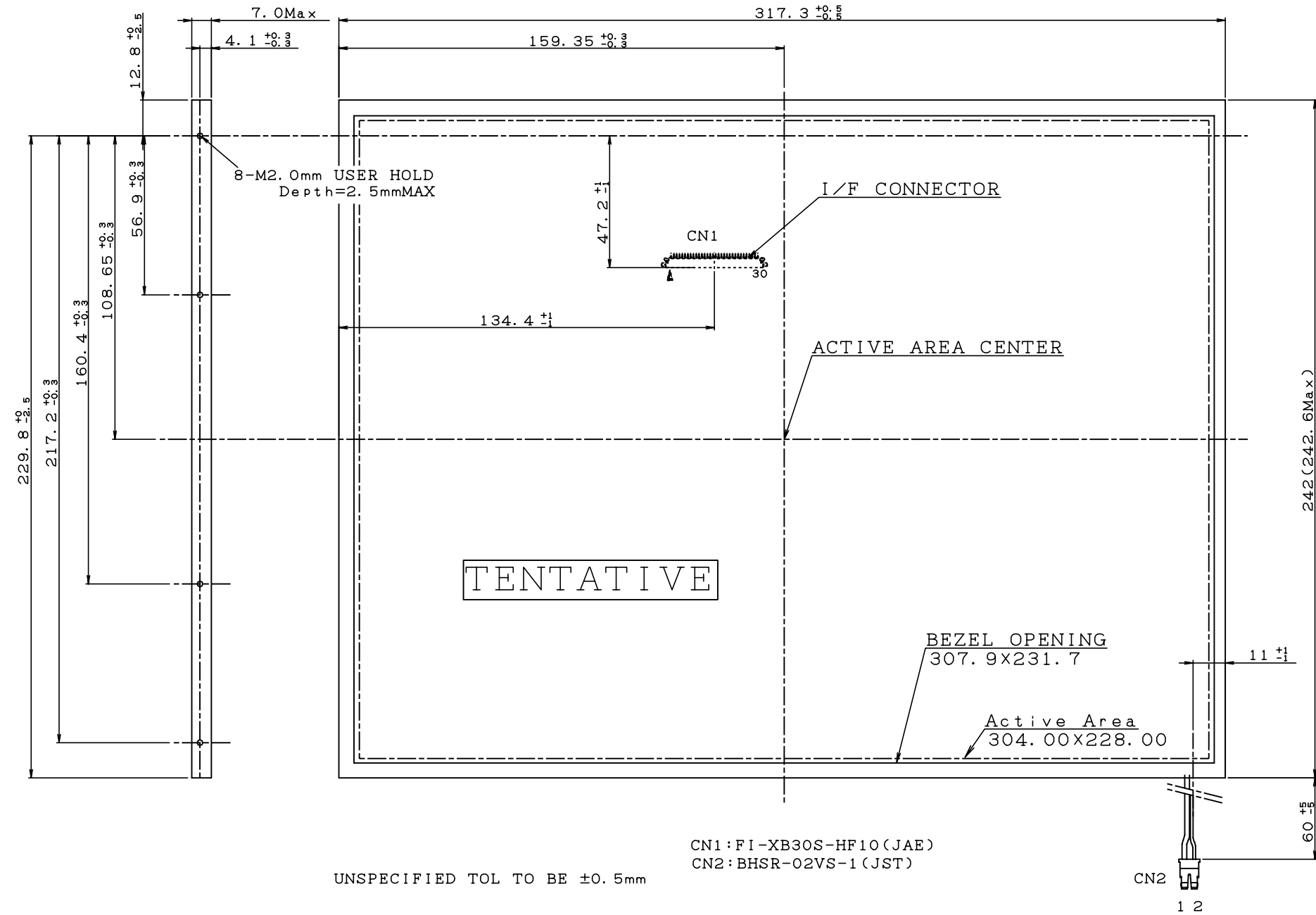MADE IN JAPAN

Model No.
Lot No.
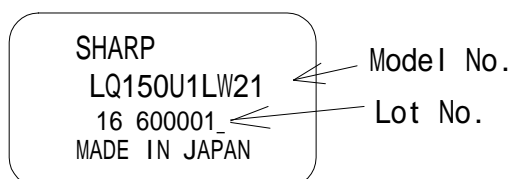
2) Adjusting volume have been set optimally before shipment, so do not change any adjusted value.
   If adjusted value is changed, this technical literature may not be satisfied.

3) Disassembling the module can cause permanent damage and should be strictly avoided.

4) Please be careful since image retention may occur when a fixed pattern is displayed for a long time.

5) If any problem occurs in relation to the description of this technical literature, it shall be resolved through
   discussion with spirit of cooperation.

LD-13652-15

7.0Max

317.3 $^{+0.5}_{-0.5}$

4.1 $^{+0.3}_{-0.3}$

159.35 $^{+0.3}_{-0.3}$

12.8 $^{+0}_{-2.5}$

8-M2.0mm USER HOLD
Depth=2.5mmMAX

56.9 $^{+0.3}_{-0.3}$

47.2 $^{+1}_{-1}$

I/F CONNECTOR

CN1

108.65 $^{+0.3}_{-0.3}$

30

134.4 $^{+1}_{-1}$

ACTIVE AREA CENTER

160.4 $^{+0.3}_{-0.3}$

242(242.6Max)

217.2 $^{+0.3}_{-0.3}$

229.8 $^{+0}_{-2.5}$

TENTATIVE

BEZEL OPENING
307.9×231.7

11 $^{+1}_{-1}$

Active Area
304.00×228.00

60 $^{+5}_{-5}$

CN1:FI-XB30S-HF10(JAE)
CN2:BHSR-02VS-1(JST)

UNSPECIFIED TOL TO BE ±0.5mm

CN2

1 2

CN1:FI-XB30S-HF10

1	GND
2	VCC
3	VCC
4	VEDID
5	NC
6	CLKEDID
7	DATAEDID
8	R1IN0-
9	R1IN0+
10	GND
11	R1IN1-
12	R1IN1+
13	GND
14	R1IN2-
15	R1IN2+
16	GND
17	CK1IN-
18	CK1IN+
19	GND
20	R2IN0-
21	R2IN0+
22	GND
23	R2IN1-
24	R2IN1+
25	GND
26	R2IN2-
27	R2IN2+
28	GND
29	CK2IN-
30	CK2IN+

CN2:BHSR-02VS-1

| 1 | High |
| 2 | Low |

LQ150U1LW21 OUTLINE DIMENSIONS

2001/06/08
DRAWING NO
2D-016-571